Recommendations for Reducing Morbidity and Mortality Related to Healthcare-Associated Infections in California

Healthcare-Associated Infections Advisory Working Group
Final Report to the

California Department of Health Services

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Table of Contents

Executive Summary

Healthcare facilities across the nation have seen a steady increase in the risk of healthcare associated infections (HAI) during recent decades. According to recently published estimates, 5 to 10 percent of hospitalized patients develop one or more HAI every year. Urinary tract infections (generally catheter-associated), surgical-site infections, bloodstream infections (mostly associated with the use of intravascular device), and pneumonia (generally ventilator-associated) account for more than 80% of all HAI. Approximately 25% of HAI occur among patients in intensive care units and two thirds are linked to antimicrobial resistance. Conservative estimates indicate that 240,000 patients of those admitted to California hospitals annually develop HAI for a cost of approximately 3.1 billion dollars. A significant proportion of these HAI can be eliminated with intensive surveillance and prevention programs.

On July 2005, in response to the need to prevent unnecessary morbidity and mortality from HAI and the recent recommendations by the Little Hoover Commission, the California Department of Health Services (DHS) convened a broadly representative expert panel, the HAI Advisory Working Group (AWG). Through a consensus-based process, the HAI AWG developed a series of evidence-based recommendations aimed at reducing the morbidity and mortality from HAI in California. These recommendations to state agencies, healthcare facilities, and medical providers included both process-specific activities and outcome-driven strategies.

The HAI AWG identified the lack of sufficient staff and financial resources for infection control, surveillance, and epidemiology within DHS, local health departments, and healthcare facilities as one of the most significant challenges for the prevention of HAI in the state. The following is a brief summary of the key recommendations contained in this report.

1. **Recommendations to the California Department of Health Services**
   A total of 16 recommendations are directed to DHS for the development and implementation of an effective HAI surveillance and prevention program, assess its resource needs, appoint an HAI public reporting advisory committee, train health facility evaluator nurses, provide guidance on the interpretation of expert prevention recommendations, collaborate with the medical board and national organizations, explore the development of electronic reporting databases, train others in infection control, assist with outbreak investigations and follow up, and provide sufficient laboratory capacity. The AWG also called for changes to CCR Title 22, Section 70739 and other relevant Sections to ensure compliance with the essential functions for infections surveillance and prevention and to assure that all hospitals periodically assess the adequacy of their infection control resources.

2. **Recommendations for Healthcare Facility Infection Surveillance and Prevention Program Infrastructure**
   The AWG issued a total of seven recommendations with specific actions steps for healthcare facilities. These recommendations include annual assessments of the risk of acquisition and transmission of HAI, sharing microbiology data on a real time basis, the development of evidence-based written infection prevention policies and procedures, protection of healthcare workers against infections diseases, development of education and training programs, assignment of infection control responsibilities to individuals with expert knowledge, and the evaluation of adequacy of resource for infection surveillance and prevention programs.

3. **Recommendations for Public and Internal Reporting of Outcome and Process Measures**
   This report includes four recommendations for reporting of HAI data. These recommendations include a call for public reporting of process measures (quality indicators), guidance on principles for public reporting programs, a call for internal (within healthcare facility) reporting of outcome and process measures, and the establishment of a standing advisory committee of outside experts to direct the public reporting of process measures.

4. **Recommendations for the Prevention of Influenza Transmission in Healthcare Facilities**
   The AWG recommended several key strategies to prevent influenza transmission. These include offering on-site influenza vaccination to all healthcare workers at no cost to the worker, tracking vaccine doses administered, requiring vaccination or written declinations, providing influenza vaccination to inpatients and outpatients as recommended by national guidelines, instituting hygiene/cough etiquette protocols, developing and implementing procedures for isolation of patients with influenza, conducting surveillance, adopting a seasonal influenza plan, reporting influenza outbreaks, and developing pandemic influenza plans and strategies for managing patients with suspect avian influenza.

5. **Recommendations for the Prevention of Central Venous Catheter Related Blood Stream Infections**
   Six recommendations were issued by the AWG for the prevention of bloodstream infections including the development and implementation of policies and procedures addressing CDC published recommendations, training and education of healthcare professionals, assessment of healthcare professional competency, determining infection rates, monitoring rates in intensive care units, and monitoring and reporting compliance with evidence-based practice process measures.

6. Recommendations for the Prevention of Antimicrobial Resistance

The AWG calls for the development and implementation of recommendations for the judicious use of antibiotics, the development and distribution of healthcare facility annual antimicrobial susceptibility results (antibiograms), evaluation of empiric antibiotic therapy, compliance with recommendations on antimicrobial prophylaxis, adherence to national guidelines for empiric antimicrobial therapy in outpatient acquired infections, and sharing of annual antibiograms with community partners.

7. Recommendations for the Prevention of Surgical Site Infections

Key recommendations for preventing surgical site infections include forming a multidisciplinary committee to periodically evaluate compliance with policies and procedures within the facility, providing risk-stratified infection rates, appropriately administering prophylactic antibiotics to surgical patients, avoiding the use of razors for hair removal, using appropriate preoperative antiseptic skin preparation agents, maintaining serum glucose levels below 200mg/dl for diabetic and cardiothoracic patients perioperatively, maintaining body temperature between 36 and 39 degrees centigrade during colorectal surgical procedures, using antiseptic techniques to prevent contaminating open wounds, adopting CDC guidelines for hand hygiene, and ensuring healthcare worker compliance with instrument cleaning, disinfecting and sterilizing.

8. Recommendations for the Prevention of Ventilator-Associated Pneumonia

The AWG made six recommendations to prevent ventilator-associated pneumonia including forming a multidisciplinary committee to periodically evaluate compliance with policies and procedures within the facility, implementing the 2003 CDC guidelines and selected Institute for Healthcare Improvement (IHI) process measures for the prevention of healthcare associated pneumonia, educating healthcare workers, assessing healthcare worker compliance with policies and procedures, monitoring infection rates using the CDC case definition for HAI pneumonia, and reporting infection rates and compliance with process measures internally.

Section I. Background

Introduction

In 1992, the Centers for Disease Control and Prevention (CDC) conservatively estimated that 2 million patients developed one or more healthcare-associated infections (HAI) contributing directly or indirectly to more than 88,000 deaths annually in the United States. A large proportion of HAI, up to 25%, occur in intensive care unit (ICU) patients. Urinary tract infections (generally catheter-associated), surgical-site infections, bloodstream infections (mostly associated with the use of intravascular device), and pneumonia (generally ventilator-associated) account for more than 80% of all HAI.

Changes in the delivery of health care may have contributed to an increase in the risk of HAI over the past decade. The number of acute care hospital beds and the average length of stay have decreased primarily due to the redirection of surgical procedures to ambulatory surgery centers. At the same time, the number of ICU beds and the severity of illness of hospitalized patients have increased (the “intensification" of acute care hospitals). Additionally the proportion of hospitalized patients who are immunosuppressed because of advancing age, chronic illnesses such as diabetes, heart disease and tobacco related respiratory diseases has grown substantially.

The hospital microbial population is also rapidly changing in part due to inappropriate antimicrobial prescribing practices in both inpatient and outpatient settings. Another major contributor to HAI is the transmission of antibiotic resistant pathogens from patient-to-patient via health care providers who do not wash their hands, fomites, and the environment.

According to the Office of Statewide Health Planning and Development (OSHPD) records, 4.0 million patients were discharged from California hospitals in 2004. Using a conservative rate of 6.0% of the total number of discharged patients it is estimated that 240,000 HAI could have occurred that year.

Assessing the financial burden of HAI in California is difficult because of the many federal, state and commercial capitation contracts that reimburse only for the original diagnosis and not for the infection that occurred as a result of that admission. A review of the literature conservatively estimates that each HAI costs an average of $13,000. Based on the number of HAI that could have occurred in California in 2004 the estimated cost of HAI to taxpayers and other purchasers of health care is estimated to be $ 3.1 billion. This excludes the cost to society for lost wages, productivity and medical legal costs of HAI.

Infection surveillance and prevention programs are possibly the most cost effective of all the hospital quality performance improvement projects implemented in hospitals today. The *Study of the Efficacy of Nosocomial*

Infection Control (SENIC) published in 1983 by the CDC demonstrated an overall 32% reduction in HAI in hospitals with high-intensity surveillance and prevention programs.

Clearly, HAI contribute significantly to morbidity, mortality, and healthcare costs in California. Preventing HAI would substantially diminish unnecessary suffering and save health care insurers, hospitals, and taxpayers billions of dollars annually.

Brief Historic Review of Infection Surveillance and Prevention Programs

Recommendations that specifically address surveillance and prevention of HAI have a long history and, in fact, were the precursor to current quality and performance improvement programs.

In 1958, the American Hospital Association (AHA) Advisory Committee recommended the implementation of infection surveillance programs in response to a nation-wide outbreak of *Staphylococcus aureus* infections identified primarily in newborn infants. Throughout the following decades the CDC, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and other professional organizations have published comprehensive recommendations and compliance standards.

In 1983, the CDC published the *Study on the Efficacy of Nosocomial Infection Control* (SENIC) which demonstrated an overall 32% reduction in HAI in hospitals with trained epidemiologists (physicians) and professional nurses who coordinated high-intensity surveillance and prevention programs.

Beginning in 1999, several other organizations and accrediting agencies including the Agency for Healthcare Research and Quality (AHRQ), the Hospital Infection Control Practices Advisory Committee (HICPAC), the JCAHO and the Institute for Healthcare Improvement (IHI) independently issued guidance documents or recommendations on infection prevention. Healthcare organizations, policymakers, program planners, consumer advocacy organizations and others were tasked with designing and implementing infection surveillance and prevention programs and responding to demands for HAI public reporting systems

For a detailed chronological listing of the most significant events in HAI prevention and control please see Appendix A.

Challenges for HAI Surveillance and Prevention in California

In addition to the nursing shortage in California, there is currently a shortage of experienced infection prevention professionals requiring hospital administrators to fill position vacancies by promoting staff with no prior training or expertise. Sixty percent (60%) or 271 of California's 450 acute care hospitals are licensed for less than 200 beds and thus are currently not required by regulation (CCR, Title 22) to have a full time equivalent infection surveillance and prevention professional. This problem is further magnified in well over 2,000 other licensed health care facilities, including nursing homes, dialysis centers and ambulatory surgical centers where health care is increasingly provided, but little or no infection prevention resources are available. Many of these facilities depend on the California Department of Health Services (DHS) staff for outbreak management and prevention guidance.

California local health departments (LHD) are frequently requested to provide consultation on the management of outbreaks in hospitals and long-term care facilities. Unfortunately, most LHD are severely understaffed and frequently lack the necessary technical expertise. Therefore, LHD are not always able to provide consultative or technical assistance to healthcare facilities or to assist in the implementation of critical HAI prevention initiatives.

Small acute care hospitals as well as other providers of healthcare are increasingly turning to the DHS and LHD for advice and consultation on issues including outbreaks of antimicrobial resistant organisms not previously considered a significant problem for these facilities. At the same time, larger hospitals are seeking advice and consultation for problems of increasing complexity including outbreaks of unusual pathogens such as atypical Mycobacteria wound infections and exposure to bloodborne pathogens through inadequately cleaned, disinfected or sterilized invasive medical devices including endoscopes.

In addition to requests for consultation by licensed health care facilities, non-health care related businesses (e.g. hair and nail salons, prisons, food services, etc.) and other state services including the Departments of Corrections, Social Services and Education also request infection prevention consultation including outbreak management assistance from the DHS and LHD.

Another major challenge is the many unregulated venues where health care is increasingly being provided. This includes private physician offices where urological, endoscope, gynecological and outpatient surgery services are performed. Suboptimal infection prevention practices in these establishments include improper decontamination and sterilization of surgical instruments and invasive devices such as endoscopes. The magnitude of this problem is unknown because HAI in these settings are not documented unless a complaint is filed with a state or local agency.

Today infection surveillance and prevention programs have had to prepare for community outbreaks such as Severe Acute Respiratory Syndrome (SARS), potential bioterrorism threats, community-associated Methicillin-resistant Staphylococcus aureus (MRSA), pandemic influenza, other new and reemerging transmissible infectious diseases, and finally public reporting of HAI. In addition to assuring that there is an effective and efficient facility program, infection control professionals are required to assist local and state health departments in disease reporting and outbreak investigation as well as planning for new and reemerging infectious disease threats such as pandemic influenza that might affect the community and the healthcare organization.

Implementation of current national recommendations to reduce HAI and improve patient outcomes requires that multidisciplinary teams set clear performance goals, establish baseline measurements, measure improvement over time and test various systems changes in order to find which processes lead to sustained improvement in a specific hospital. Developing baseline HAI data and measuring improvement over time requires intense surveillance including observation, the use of standardized definitions of infections as well as the collection, analysis, validation, and reporting of data by infection prevention professionals.

The Healthcare Associated Infections Advisory Working Group

In a 2005 follow-up report to the governor, the Little Hoover Commission (LHC) reemphasized their previous recommendations for improvements in infection prevention programs at the state level and urged the Governor and the Legislature to prioritize "*an aggressive response to hospital-acquired infections"*. In July 2005, in response to these recommendations and to prevent unnecessary morbidity and mortality from HAI, the DHS convened a broadly representative expert panel, the HAI Advisory Working Group (AWG). This group included infection surveillance and prevention professionals, infectious disease specialists, epidemiologists, hospital administrators and public health experts. In addition, the group had representation from a variety of stakeholders, including the California Medical Association, California Nurses Association, Consumer's Union, California Hospital Association, Service Employee International Union, California Conference of Local Health Officers, Los Angeles County Department of Health, the California APIC (Association for Professionals in Infection Control and Epidemiology) Coordinating Council, California Association of Health Facilities, California Healthcare Foundation, Infectious Disease Association of California, and the California Ambulatory Surgical Association. This advisory working group was tasked with developing a broad set of recommendations by December 31, 2005 that public and private entities could implement to reduce HAI in California. In developing their recommendations the group considered the latest research, reviewed best practices, and considered information presented by subject matter experts.

To accomplish the mission the HAI AWG used a decision making process based on reaching group consensus to assure support for each of the final recommendations. In recognition of the public's interest on the subject, the HAI AWG proceedings were posted on the DHS website monthly and time for public comment was incorporated into each meetings agenda.

The HAI AWG held monthly meetings beginning on July 25, 2005. Because written recommendations were due by December 31, 2005, subgroups were formed to address the following areas: program infrastructure, public reporting, influenza, bloodstream infections, antimicrobial resistance, surgical site infections, and ventilator associated pneumonia. These subgroups drafted recommendations for the full HAI AWG to consider and act upon and were instrumental in the development of this final report.

The following section of this report details the specific recommendations made by the HAI AWG to DHS and their general recommendations in each of the critical areas.

Section II. Consensus Recommendations

1. Recommendations to the California Department of Health Services (DHS)

Recommendation 1.1
The HAI AWG strongly recommends the development and implementation of an infection surveillance and prevention program within the DHS with adequate resources to serve and assist licensed and unlicensed healthcare facilities in California.

Recommendation 1.2
In order to assure implementation of the recommendations within this document, the HAI AWG strongly urges the DHS to conduct a comprehensive assessment of currently available resources. The DHS should consider using methodology similar to the joint CDC and APIC study *Staffing requirements for infection control programs in US healthcare facilities: Delphi* Project published in AJIC 2002, Oct: 30(6) 321-33 to determine appropriate staffing for the DHS and local health departments (LHD) infection surveillance and prevention programs.

Recommendation 1.3
To assist in the mission of reducing HAI, appoint an advisory committee composed of infection prevention professionals, hospital administrators, hospital epidemiologists, public health officers as well as providers and purchasers of health care. The purpose of the committee would be to direct and monitor the implementation of public reporting of quality measures to ensure the public has access to timely, relevant and accurate data.

Recommendation 1.4
Educate Licensing and Certification Program Health Facility Evaluator Nurses (HFEN) as soon as possible to effectively survey hospitals and other licensed healthcare facilities for compliance with current and future infection surveillance and prevention strategies and regulations.

Recommendation 1.5
Provide guidance to HFEN on the interpretation of infection surveillance and prevention recommendations issued by CDC, CDC's HICPAC, SHEA, APIC and other professional organizations.

Recommendation 1.6
Communicate the recommendations contained in this consensus document to the JCAHO. Request JCAHO that surveyors responsible for accrediting California healthcare facilities receive education and training to effectively

evaluate compliance with current and future infection surveillance and prevention strategies.

Recommendation 1.7
Communicate the recommendations contained in this consensus document to the Centers for Medicare and Medicaid Services (CMS) to assist in the development of effective regulatory interpretive guidelines.

Recommendation 1.8
Communicate the recommendations contained in this consensus document to the Medical Board of California and offer assistance in developing effective infection prevention strategies to physicians who perform invasive procedures in non-certified facilities.

Recommendation 1.9
Explore the possibility of developing a statewide electronic reporting database to monitor increases in specific invasive antibiotic resistant organisms such as MRSA, as well as, central line related bloodstream infections and surgical site infections related to coronary artery bypass surgery and other high risk surgical procedures.

Recommendation 1.10
Participate in developing educational programs on infection prevention for healthcare providers, LHD, and the general public.

Recommendation 1.11
Provide consultation and assistance to other State agencies (e.g., Departments of Corrections, Social Services, etc.) in the development and implementation of infection prevention guidelines.

Recommendation 1.12
Provide educational materials and web-based training programs and current infection prevention information on a website.

Recommendation 1.13
Assist in the investigation and follow-up of clusters and outbreaks of healthcare facility associated infections.

Recommendation 1.14
Revise CCR Title 22, Section 70739 and other Title 22 sections related to infection surveillance and prevention programs to ensure compliance with the seven essential functions of an effective infections surveillance and prevention program as outlined in the *"Requirements for Infrastructure and Essential Activities of Infection Control and Epidemiology: A Consensus Panel Report"* and any future recommendations.

Recommendation 1.15
Title 22, Section 70739 and other Title 22 sections should be revised to assure that all hospitals periodically assess the adequacy of resources allocated to the infection control program for staffing infection surveillance and prevention programs utilizing the recommendations outlined in the joint CDC and APIC study entitled "*Staffing Requirements for Infection Control Programs in US Healthcare Facilities: Delphi Project"* published in *AJIC 2002, Oct: 30(6) 321-33*.

Recommendation 1.16
Provide sufficient laboratory capacity to support healthcare facilities and LHD with pathogen identification, molecular epidemiology and antimicrobial susceptibility testing for the investigation of outbreaks and surveillance of antimicrobial resistance.

2. Recommendations for Healthcare Facility Infection Surveillance and Prevention Program Infrastructure

Recommendation 2.1
Healthcare facility senior leadership, in collaboration with the appropriate infection prevention professionals, should evaluate and demonstrate adequacy of resources directed to the infection surveillance and prevention program. The following are essential action steps for the implementation of this recommendation.

- The evaluation should be based on historic surveillance data (if available and interpretable), the need to reduce HAI-associated costs, the current and projected community population growth, the volume of high risk and high cost invasive inpatient and outpatient procedures performed, projected advances in technology, the number of intensive care unit beds, number of emergency department visits, the number of outpatient visits, number of licensed medical-surgical beds and number of employees.

- All healthcare facilities should utilize the joint CDC and Association for Professionals in Infection Control and Epidemiology (APIC) study S*taffing requirements for infection control programs in U.S. healthcare facilities: Dephi Project* to determine appropriate staffing for infection surveillance and prevention programs. Additionally the SENIC study conducted by CDC, which recommends that each hospital have available at least one dedicated and educated physician epidemiologist should be utilized to determine staffing for facility programs.

Recommendation 2.2
Healthcare facilities should assess the risk of acquisition and transmission of HAI at least annually as the demographics of the geographical area changes, new diagnostic and therapeutic services are introduced, construction and renovation

projects impact normal internal or external operations or other factors known to affect HAI rates arise. The following are essential action steps for the implementation of this recommendation.

- Risk assessment for HAI should be based on historic surveillance data (if available), an assessment of high risk, high cost, high volume invasive procedures performed and the socioeconomic status of the population served.
- A written surveillance plan should document the specific populations and services to be included in the program, definitions and data sources to be used for data collection, risk stratification methods, numerators and denominators, preparation and distribution of reports and aggregated comparative (internal or external) data used to guide meaningful comparisons.
- Surveillance data should be analyzed, validated, and reported to department and service managers, administrators and to medical staff chiefs of service, as applicable. Infection rates should be easy to understand and thoroughly explained.
- Where available, only standardized definitions of infections for surveillance purposes should be used for data collection, analyses and reporting.
- Appropriate clinical data should be used to monitor and improve processes of care and clinical outcomes. Administrative (medical records coding) data should not be the sole source of HAI data.
- Healthcare facilities should consider training technicians to collect surveillance data. Healthcare facilities using data mining technology should validate the data using alternate sources such as prospectively collected HAI data.
- Sentinel events should be voluntarily reported to the JCAHO.
- Unusual occurrences such as outbreaks which threaten the welfare, health and safety of patients, personnel or visitors must be reported to the LHD and to the CDHS Licensing and Certification Program district office with jurisdiction over the facility (California Code of Regulations, Title 22).
- Healthcare facilities should use baseline surveillance data including microbiologic data to identify clusters and outbreaks of infections.
- Antimicrobial resistant organisms, such as MRSA, should be tracked and trended, especially healthcare-associated transmission.

Recommendation 2.3

Appropriate and timely microbiology data should be made available on a real time basis. The following are essential action steps for the implementation of this recommendation.

- To facilitate multiple automated streams of aggregate data, sustained and real time support should be provided by the facility's information technology department including: microbiology, patient demographics, patient location, length of stay, antimicrobial utilization, invasive

procedures and device utilization days, attending and consulting physicians and billing data.

- Microbiological data should be electronically retrievable and maintained in a manner that permits rapid access to reports by type of organism, antimicrobial sensitivity pattern, type of clinical specimen, patient identification, attending physician, location of patient when culture was obtained, current location of patient if different, dates when the culture was obtained, preliminary and final culture results and information on who reported and who received critical value reports.
- An annual aggregated antibiogram should be made available to the healthcare providers. Microbiologists should comply with the recommendations of the Clinical and Laboratory Standards Institute (CLSI)
- Staff should be trained to properly collect clinical specimens for culture, interpret culture and sensitivity reports, learn to distinguish infection from colonization, and report critical laboratory values to the healthcare providers. Cultures should be obtained prior to initiating antibiotic therapy, when possible.
- A baseline rate of specific organisms at specific anatomical sites should be maintained by the laboratory and increases in the incidence of specific or unusual organisms above baseline should be reported to the infection surveillance and prevention professional.
- The microbiologist should work closely with infection prevention professionals and participate in decisions related to obtaining surveillance cultures, be capable of rapidly identifying organisms related to bioterrorism and outbreaks of diseases in the community and the hospital, provide assistance in obtaining rapid diagnostic tests and molecular studies and implement a “critical or unusual value” notification system.
- Adequate pathology services should be available to assist with the diagnosis of an infectious disease.

Recommendation 2.4

Written infection prevention policies and procedures should be evidence-based, developed by infection control professionals in collaboration with appropriate physicians and other healthcare facility staff, developed to fit the structure, function and population of the healthcare facility, communicated to staff, enforced by staff physicians, administrators, managers and supervisors and updated periodically. The following are essential action steps for the implementation of this recommendation.

- Infection prevention strategies should be evidenced-based and derived from publications in peer-reviewed articles or recommended by credible expert panels. Infection prevention research and innovation is strongly encouraged.
- Hospitals should implement sustainable processes for compliance with the IHI infection prevention and sepsis related measurement bundles.

- Infection prevention strategies for each department and service should be developed, implemented, revised as necessary and reviewed by the infection surveillance and prevention committee for effectiveness in protecting patients and employees.
- Isolation strategies should be based on an assessment of the risk for pathogen transmission and according to CDC, SHEA and APIC guidelines.
- Department and service managers and supervisors should frequently monitor staff for compliance with hospital and department specific infection prevention procedures including hand hygiene, isolation and use of personal protective equipment policies. Corrective action should be taken as necessary and the findings should be reported to the infection prevention committee.
- Environmental service managers should assure that staff are properly trained to maintain a sanitary environment and periodically observed for competence in the procedures for which they are responsible.
- Department and service managers responsible for cleaning decontaminating and sterilizing medical equipment and supplies should develop and implement policies based on manufacturer's instructions as well as recommendations from the infection surveillance and prevention committee and professional organizations. Staff should be properly trained and periodically observed for competence in the procedures for which they are responsible.

Recommendation 2.5

Healthcare facilities should protect their personnel from exposure to infectious diseases. Employees should comply with work restrictions when sick with an infectious disease and be offered immunization as recommended by current ACIP and CDC Guidelines for healthcare workers. The following are essential action steps for the implementation of this recommendation.

- Employee/occupational health policies and procedures related to the infection prevention program should be developed, implemented, monitored and revised as necessary to assure consistency with current evidence-based recommendations.
- Infection prevention professionals should work collaboratively with employee health professionals.
- Employee/occupational health policies and procedures related to infectious diseases should be reviewed and approved by the hospital's infection surveillance and prevention committee.
- New employees should be evaluated for evidence of conditions related to communicable diseases, such as, Tuberculosis.
- Employees should be offered immunizations for vaccine preventable infections as required by regulation or recommended by current CDC guidelines and the Advisory Committee on Immunization Practices for Healthcare Personnel.

- Employee/occupational health programs should implement the most current CDC recommendations for post exposure prophylaxis to blood-borne pathogens such as Hepatitis B virus, Human Immunodeficiency Virus (HIV), Tuberculosis and other infectious diseases.
- Policies and procedures for evaluating employees exposed to a communicable disease, ill with a communicable disease, indications for work restrictions and return to work should be developed, implemented and communicated to all employees. Compliance should be monitored.
- Employee health professionals should work closely with non-hospital based agencies and organizations such as paramedics, homecare personnel, nursing registries and nursing homes and assist in the management of an exposure to a communicable or infectious disease.
- Employee health professionals should define circumstances in which an agency should report newly identified communicable disease in staff who have worked recently.

Recommendation 2.6

To prevent HAI and occupational exposure to infectious diseases, healthcare facilities should plan, implement and revise organized education and training programs in consultation with experts in epidemiology, infectious diseases and infection prevention professionals. The following are essential action steps for the implementation of this recommendation.

- Persons working or consulting in the organization including, but not limited to, administrators, department managers and supervisors, medical and nursing staff, students and volunteers should be trained in current infection prevention strategies and be able to translate didactic principles into practice. Tools should be developed and used to verify the skills of direct and indirect patient care providers.
- Direct patient care providers including nurses, physicians and diagnostic and therapeutic ancillary staff should be required to demonstrate minimum written, verbal and performance competency skills in hand hygiene, the use of personal protective equipment, facility specific isolation procedures, and the CDC precaution level procedures (standard, contact, droplet, and airborne).
- Department administrators, managers and supervisors should frequently observe healthcare worker-patient interactions for compliance with hand hygiene, use of personal protective equipment and facility specific isolation procedures and take corrective action as necessary.
- Educational programs should be evaluated periodically for effectiveness and attendance should be monitored.
- Education programs should meet the needs of specific employee work groups including the literacy level and primary language spoken.
- New and revised infection prevention strategies should be communicated and all affected staff should be responsible for implementing these strategies.

- The clinician appointed as the hospital epidemiologist (Chair, Infection Prevention Committee) should, within one year of accepting the position, attend an infection surveillance and prevention training program or have commensurate experience. Attendance should be documented in the credential files. Ongoing continuing education specific to infection prevention is highly recommended.
- The hospital epidemiologist (Chair, Infection Prevention Committee) should have a job description and, when indicated, a contract that specifies the hospital's requirements for appropriate initial and ongoing training, expected duties such as committee participation, antibiotic utilization, consultation with the infection control professional, education of staff physicians, and assisting with a cluster or outbreak investigation and with endemic HAI reduction.
- The hospital epidemiologist should serve as the infection prevention program champion who promotes appropriate strategies through communication and problem resolution with peers.
- Members of the infection surveillance and prevention committee (required by CCR, Title 22), should be knowledgeable about infection prevention strategies, participate in enforcing the program goals and set the example for their peers as well as the employees through participation in the hand hygiene program and compliance with transmission prevention policies.

Recommendation 2.7

Because responsibilities of infection surveillance and prevention programs are expanding due to increases in the intensity and complexity of patient care services delivered, the severity of patient illness and the delivery of care in ambulatory settings, the healthcare facility should assign the responsibility for effectively managing its infection surveillance and prevention program to an individual or individuals with expert knowledge of surveillance and prevention skills. The following are essential action steps for the implementation of this recommendation.

- Infection surveillance and prevention professional positions should be at least the level of manager in the organization and report directly to a senior administrator.
- Infection prevention professionals should communicate surveillance data, problems and interventions directly to the senior management team, medical and nursing staff committees and the governing body.
- The qualifications of the designated professional may be met thorough ongoing education, training and experience. Certification through a professional organization is highly recommended.
- Infection prevention professionals should coordinate all surveillance and prevention activities within the organization.
- Infection prevention professionals should work closely with LHD in developing rationale strategies for controlling emerging infectious diseases such as pandemic influenza.

- Infection prevention professionals should be visible in the organization, available for consultation and have the authority to cross between department and service lines.
- Infection prevention strategies should be based on current and evolving scientific evidence as provided by the CDC's HICPAC, CDC, SHEA, APIC, other professional organizations, and peer-review publications.
- The appropriate duties of the infection prevention professional are those directed primarily toward HAI prevention. If duties unrelated to that goal are assigned, adequate resources should be provided to ensure that the infection surveillance and prevention program is not compromised.
- Adequate resources including laboratory, equipment, supplies, computer hardware and software, and access to electronic libraries should be allocated to the program.
- The program should have a designated cost center, budget, funding and resources to support recommended interventions.

3. Recommendations for Public and Internal Reporting of Outcome and Process Measures

Public reporting of healthcare performance measures is gaining popularity as a means to hold providers accountable for the quality of medical care. Consumers and payers have begun to demand quality indicator data from providers in order to make more informed healthcare decisions. Providers are generally in agreement but have concerns that the data can be biased or misleading because of case ascertainment and risk adjustment problems and may potentially lead to unintended adverse consequences for patients.

According to the CDC's HICPAC, at this time there is insufficient evidence regarding the effectiveness of public reporting systems to prevent or reduce the incidence of HAI. Nevertheless, the HAI AWG has concluded that public reporting of relevant quality indicators probably has the potential to decrease HAI in California, but only if such a program is implemented carefully and with full regard to the consequences to providers and patients.

The CDC's HICPAC recently published a set of guidelines containing detailed recommendations for policymakers regarding this issue. We urge California policymakers to study this document, which highlights the essential elements of a public reporting system for HAI, the potential consequences of mandatory public reporting, and a recommended starter set of quality indicators.

Quality indicators can generally be divided into process measures and outcome measures. Process measures examine processes of care (such as surgical antimicrobial prophylaxis, influenza vaccination or central line insertion practices) that should not vary substantially from patient to patient or facility to facility. They do not require adjustment for the patient's risk of infection or the mix of patients

seen by a particular facility. The goal of these processes is, ultimately, to improve outcomes. We believe that, if healthcare providers adhere to appropriate process measures nearly 100% of the time, we will see dramatic reductions in the outcomes we are trying to prevent, namely HAI and mortality. The HAI AWG achieved consensus in its recommendation to endorse public reporting of process measures intended to reduce healthcare associated infections. The HAI AWG also strongly encourages providers to internally monitor their own adherence to evidence-based processes that are known to reduce HAI.

Outcome measures describe outcomes of care (such as rates of certain infections, deaths or readmissions attributable to infections) that may or may not be the result of processes in place in healthcare facilities. Healthcare consumers may find outcome measures valuable because they represent direct results of healthcare delivery. Advocates of outcome measures claim that the powerful message delivered by disclosure of outcomes may have a much greater effect on quality improvement initiatives than indirect process measures.

However, outcome measures may be more likely to be subject to confounding, bias and misinterpretation. Different facilities see patients with different distributions of severity of illness, underlying diseases or types of invasive procedures; thus, tertiary care facilities that treat the sickest patients will tend to have higher infection rates, regardless of their adherence to evidence-based infection prevention measures. Risk-adjustment calculations can partially reduce this kind of bias, but many feel the science of risk-adjustment is currently not up to the task of creating meaningful comparisons between the varieties of healthcare facilities that might be compared by a California healthcare consumer. Additionally, facilities with superior surveillance systems for HAI may be penalized because they do a better job identifying and reporting infections; conversely, those with poor or non-existent surveillance will appear to have few or no infections or deaths attributable to infections.

Paradoxically, outcome reporting can create incentives for providers to turn away the sickest and most severely ill patients. Facilities that are being judged on deaths or infection rates may choose to withhold treatment from patients at higher risk for those outcomes in an attempt to improve publicly reported ratings. They may also inappropriately transfer those patients to different levels of care, other institutions, or out of state to avoid negative publicity for adverse outcomes. Finally, mandatory reporting of outcome measures may cause facilities to divert resources away from patient care towards collection of data for favorable risk-adjustment purposes.

The HAI AWG achieved consensus on the recommendation that all facilities should routinely collect and analyze important outcome measures, such as deaths and morbidity due to HAI or the measures developed by the CDC's HICPAC, for internal benchmarking and continuous quality improvement.

However, the HAI AWG could not achieve consensus on a recommendation regarding public reporting of healthcare-associated infection rates or mortality.

Recommendation 3.1
There should be requirements or strong incentives for public reporting of process measures (including those discussed elsewhere in this report or endorsed by CDC's HICPAC) that are standardized across facilities.

Recommendation 3.2
DHS should take into account the following principles when developing any public reporting program:

- Ensure all quality measures are standardized, evidence-based, representative of important problems and useful both to the consumer as well as the facility for quality improvement.
- Develop transparent risk-adjustment standards for hospitals with different patient mixes.
- Support adequate case-finding methods; in-house and post-discharge surveillance; and data validity checks.
- Do not use administrative (billing) data as the sole means of measuring processes or outcomes.
- Minimize the (often unfunded) burden of measurement on providers by developing reporting systems that interface with those already in use for other initiatives and planning for automated, electronic reporting for those facilities implementing appropriate health information technology.
- Evaluate possible unintended adverse consequences of public reporting, including the potential for high-risk patients to be denied medical care.
- Encourage truthful reporting by publicly publishing results in comparison deciles (e.g., top 10%, top 20%), rather than specific numerical results (e.g., 94% vs. 92% performance) that invite gaming the system to outscore competitors.
- Slowly phase in any new mandates for public reporting in a transparent fashion, open to public comment from both consumers and providers.
- Issue timely and verifiable reports that reflect current conditions in the healthcare facilities.

Recommendation 3.3
All healthcare facilities should report outcome and process measures internally. At a minimum, these should include the CDC's HICPAC outcome and process measures. These measures should be standardized and reproducible within the institution. They should be used as internal benchmarks to inform facility leadership and staff on the status of infection prevention and control efforts.

Recommendation 3.4
DHS should convene a standing advisory committee of outside experts to direct and monitor the implementation of public reporting of quality measures, to ensure the public has access to timely, relevant, and accurate data.

4. Recommendations for the Prevention of Influenza Transmission in Healthcare Facilities

Reports of transmission of influenza from healthcare workers to patients have been extensively documented in the scientific literature. Recent evidence suggests that both symptomatic and asymptomatic persons are capable of transmitting the virus. The ACIP, CDC's HICPAC and SHEA have recently approved stronger recommendations to improve persistently low (~ 36%) influenza vaccination rates among health care workers.

The term 'health care worker' as defined by the National Foundation for Infectious Disease extends to any employee in a health care setting who comes into direct contact with patients. This includes physicians, nurses, physician assistants, students of the health care professions and other personnel in hospital and outpatient settings. In addition, housekeepers, dietary workers, social workers, physical therapists, medical emergency response workers, employees in nursing homes and other chronic care facilities, and those who provide care in the home setting should be included in the definition of a health care worker for these recommendations.

Strategies that have been effective in improving healthcare worker influenza vaccination rates include: 1) support by senior management, 2) mobile vaccination carts and 3) the availability of vaccination during all work shifts.

Recommendation 4.1
Using a multidisciplinary approach, each healthcare facility should develop, implement and evaluate the following action steps:

- Offer influenza vaccination to healthcare workers at the work site, at no cost and to all shifts.
- Accurately track the number of vaccine doses administered to healthcare workers. Provide vaccination rates by department to department managers. Include workers vaccinated elsewhere during the same season in reported rates.
- Require vaccination or written declination by healthcare workers providing direct patient care (see proposed declination statement below).
- Document the reasons that healthcare workers decline vaccination, such as previous receipt of the current vaccine, religious objections or fear of needles. (Due to privacy concerns, healthcare workers may decline to state their reasons for refusal).

- Use these responses to develop opportunities for education and intervention.
- Offer intranasal influenza vaccine as appropriate to those who express fear of needles.
- Implement a system to track other healthcare worker groups who may rotate through the institution (e.g. licensed independent practitioners) especially those providing care to high-risk patients.
- Address in contract language influenza vaccination of contract workers.

The following is an example of a healthcare worker declination to be vaccinated for influenza:

Due to my occupation, I may transmit influenza to my patients and other healthcare workers, as well as to my family and friends, even though I have no symptoms. This can result in serious infection, particularly in persons at high risk for influenza complications. I have received education about the effectiveness of influenza vaccination as well as possible adverse events. I have been given the opportunity to be immunized with influenza vaccine at no charge to myself. However, I decline influenza vaccination at this time. I understand that if I have not been vaccinated, by declining this vaccine, I continue to be at risk of acquiring influenza, potentially resulting in transmission to my patients and others. If in the future if I want to be immunized with influenza vaccine, I can receive the vaccine, if available, at no charge to myself.

Recommendation 4.2

Healthcare facilities should provide influenza vaccination to appropriate inpatients as recommended by national guidelines.

Recommendation 4.3

To minimize risk of transmission of endemic seasonal influenza, healthcare facilities should implement the following actions steps:

- Institute respiratory hygiene/cough etiquette protocols in high risk exposure areas such as emergency departments and outpatient clinics, to include visual alerts, tissues to contain respiratory secretions, no-touch receptacles for discarded tissues, sinks for hand washing or alcohol antiseptic hand hygiene products, readily available masks at point of initial contact, and training of front line staff to offer education, masks and tissues to persons with respiratory symptoms.
- Define and implement procedures for identifying and appropriately isolating patients with influenza.
- Ensure early detection of influenza illness and identify outbreaks among healthcare workers by implementing a procedure for the evaluation of healthcare workers with febrile respiratory illness.
- Have a seasonal influenza outbreak response plan to include:
    - Planning for staffing contingencies,
    - Access to rapid diagnostic testing,

  - Conditions for initiation of antiviral prophylaxis, and
  - Conditions to trigger limitation of group activities, restriction of visitors, closure to admissions or other appropriate responses.
- Report influenza outbreaks both internally and to the local health department and the Department of Health Services Licensing and Certification office with jurisdiction over the facility.

Recommendation 4.4

Healthcare facilities should have a plan for managing a patient suspected or known to have the strain of avian influenza which is currently not sustainably transmitted human-to-human. The plan should address:

- Patient identification,
- Contact with the local health department,
- Specimen collection. Directions are available at http://www.dhs.ca.gov/ps/dcdc/VRDL/html/FLU/H5N1/H5N1specimen%20collectionguidelines.pdf .
- Reporting using the state form, available at http://www.dhs.ca.gov/ps/dcdc/VRDL/html/FLU/H5N1/CA%20Avian%20Flu%20Case%20Report%20Form%209.05.pdf .
- Isolation,
- Healthcare worker use of personal protective equipment, and
- Communication plan.

Recommendation 4.5

Healthcare facilities should have a pandemic plan which:

- Documents collaboration with local or state health departments,
- Describes management of possible pandemic influenza including:
  - Patient identification,
  - Reporting to local health departments,
  - Specimen collection,
  - Isolation, and
  - Use of personal protective equipment.
- Describes effective surveillance to ensure early detection of influenza illness in healthcare workers, including a procedure for the evaluation of healthcare workers with febrile respiratory illness, to identify outbreaks among workers.
- Discusses staffing adjustments, surge capacity, resource planning, communications, and infection control issues.
- Shows consistency with and understanding of the federal (http//www.pandemicflu.gov) and state (http//www.dhs.ca.gov) pandemic flu plans.

5. Recommendations for the Prevention of Central Venous Catheter Related Blood Stream Infections

Bloodstream infections (BSI) caused by central venous catheters (CVC) are the focus of numerous quality outcome projects including Leapfrog, National Quality Forum (NQF), and the IHI 100K Lives Campaign. The reason for this focus is the high-risk, high-cost impact of this HAI and the multiple opportunities for decreasing infection rates.

In California it is estimated that nearly 12,000 patients develop a CVC- related BSI annually. The associated cost in primarily non-reimbursed compensation to hospitals ranges from $35,000 to $56,000 per infection or $400 million to $667 million annually.

Risk factors for BSI, especially in ICU patients, include the length of time the catheter is in place, colonization of the insertion site with hospital-acquired pathogens and the numerous manipulations by trained and untrained staff for the purpose of administering medications, fluids and blood products each day. Patient related risk factors such as underlying diseases and severity of illness also contribute to the risk of infection.

Central venous catheters are also used extensively in outpatient settings including oncology and dialysis centers. The extent to which infections occur in these settings is unknown as there is limited or no surveillance and therefore no ability to determine trends in infection rates. Additionally verification of compliance with evidence-based infection prevention practices by DHS and JCAHO surveyors is often absent in these settings. Poor infection prevention practices, including training on insertion and maintenance of CVC, suboptimal safe-injection practices, and reuse of multi-dose vials have been cited as causes of outbreaks of bacterial infections, Hepatitis B virus, and Hepatitis C virus in these facilities.

Recommendation 5.1
Healthcare facilities using CVCs should develop and implement policies and procedures addressing, at a minimum, category 1A recommendations of the *CDC Guidelines for the Prevention of Intravascular Catheter-Related Infections*, published in the MMWR (August 9, 2002/Vol 51/No. RR10).

Recommendation 5.2
Healthcare facilities using CVCs should provide training and education to healthcare professionals responsible for inserting and maintaining intravascular catheters.

Recommendation 5.3
Healthcare facilities using CVCs should assess healthcare worker competency for inserting and maintaining CVC. The method for documenting competency assessment should be determined by the healthcare facility.

Recommendation 5.4
Healthcare facilities using CVCs should determine CVC-associated BSI infection rates using the CDC surveillance definitions.

Recommendation 5.5
Healthcare facilities using CVCs should monitor, at a minimum, CVC-associated BSI infection rates in intensive care units.

Recommendation 5.6
Healthcare facilities using CVCs should monitor and report compliance with the following process measures:

- Maximum barrier precautions on insertion,
- Optimal catheter insertion site selection with subclavian vein as the preferred site,
- Chlorahexidine skin antisepsis,
- Daily review and assessment of catheter's necessity, and
- Hand hygiene during insertion and for catheter manipulations

6. Recommendations for the Prevention of Antimicrobial Resistance

The prevalence of multi-drug resistant organisms (MDRO) in U.S. health care facilities has increased steadily over the last several decades. MRSA was first isolated in the U.S. in 1968 and by 2002 accounted for 57% of *S. aureus* infections in ICU patients reported to the National Nosocomial Infections Surveillance (NNIS) system. A similar rise in prevalence occurred with vancomycin-resistant enterococcus (VRE) during the 1990s. Although ensuring adequate matching in comparisons of patients infected with MDROs and control patients is problematic, several studies have reported an association between MDRO infections and increased morbidity and mortality, length of stay, and healthcare costs. In 1998, the Institutes of Medicine estimated that in the U.S antimicrobial resistance cost at least $4 - $5 million annually.

The prevalence of MDRO varies temporally, geographically, and by healthcare setting. The type and level of acute care also influences the prevalence of MDRO. Intensive care units, especially those in urban areas and tertiary care facilities, have a higher prevalence of MDRO infections than do small community hospitals. High rates of MRSA, VRE or extended spectrum beta lactamase (ESBL)-producing *gram-negative bacilli* colonization prevail in some, but not all

long-term care facilities (LTCF). The frequency of clinical infection with these pathogens, however, is lower in LTCF residents than in patients in acute care hospitals. Antimicrobial resistance is also an emerging issue in the community. The prevalence of a clonally distinct strain of MRSA causing skin and soft tissue infections as well as invasive disease has increased dramatically over the past 5 years.

The clinical, logistical and financial impacts of the emergence and prevalence of a specific MDRO are important factors that determine healthcare facility prioritization of MDRO control programs. There are many reports in the published literature of successful control of outbreaks of MDRO in healthcare facilities. Prevention of antimicrobial resistance requires prevention of transmission and judicious antibiotic use to minimize the emergence of MDROs. The HAI AWG discussed several issues related to preventing transmission of MDROs within healthcare facilities, but could not achieve a consensus or majority opinion on the subject. Since the HAI AWG is charged with making specific and feasible recommendations to the CDHS within a specific time frame, the HAI AWG elected to focus recommendations on the area of antibiotic stewardship to reduce the pressure for the emergence of antibiotic resistant pathogens.

Recommendation 6.1
Recommendations for the judicious use of antibiotics should be developed, implemented and monitored jointly by the infection prevention and pharmacy and therapeutics committees in consultation with chiefs of surgical and medical specialties, hospitalists, and intensivists.

Recommendation 6.2
Microbiologists, in consultation with infection prevention and pharmacy and therapeutics committees should develop and distribute annual antimicrobial susceptibility results (i.e., antibiograms) of common pathogens identified. The antibiogram should be based on single isolates from the same patient and be compiled according to the Clinical and Laboratory Standards Institute (CLSI) and made available to all staff and consulting physicians.

Recommendation 6.3
Empiric antibiotic therapy should be evaluated within 48 hours after being initiated. Therapeutic antibiotic therapy should be based on the antimicrobial susceptibilities of the organism identified. The duration of therapeutic antibiotic therapy should be based on recommendations from professional organizations and published studies.

Recommendation 6.4
Healthcare facilities should provide feedback to providers (surgeons and anesthesiologists) regarding compliance with recommendations on surgical antimicrobial prophylaxis. (See recommendations 7.1 – 7.10)

Recommendation 6.5
Healthcare facilities should be encouraged to share their annual antibiograms with community partners, including other healthcare facilities and the local health department, to assess the spread of MDROs and share strategies to control these organisms. Isolates may be shared with public health laboratories with the capability of applying molecular techniques to determine the extent of transmission of MDROs among facilities.

7. Recommendations for the Prevention of Surgical Site Infections

More than 70 million surgical procedures are currently performed each year in the U.S. Surgical site infections (SSI) are the most frequently reported HAI among hospitalized patients and account for a significant portion of healthcare costs. It is estimated that in the future nearly 75% of all surgical procedures will be performed in “ambulatory”, “same-day” or “outpatient” operating rooms that are not subjected to regulatory oversight, further increasing the importance of implementing SSI prevention practices.

The identification of SSI involves interpretation of clinical and laboratory findings and it is crucial that a surveillance program use standardized definitions of infection. Providing risk-adjusted rates has been shown to reduce surgeon-specific rates of SSI.

Perioperative antimicrobial prophylaxis that is safe, cost-effective, has a spectrum of action that covers most of the probable intra-operative bacterial contaminants, and achieves bactericidal tissue and serum levels at the time of skin incision should be used. Recommendations for the timing of administration are based on a study of 2,847 surgery patients at Latter-Day Saints Hospital in Salt Lake City where the lowest incidence of post-operative infection was associated with antimicrobial administration during the one hour period before the incision.

Most SSI are caused by organisms present on the patient’s skin prior to surgery, therefore preventing surgical site contamination is of critical importance. Prior to applying an antiseptic skin preparation the area surrounding the intended surgical site should be free of gross soil. The prepared area should be large enough to extend the incision, and to create new incisions or drain sites, if necessary. There is no evidence that hair removal from a surgical site has a beneficial effect on surgical outcomes. In contrast, shaving results in breaks in the skin and increases the risk of SSI. Shaving immediately before the operation is associated with lower SSI rates compared to shaving 24 hours before the operation. Depilatory agents can cause hypersensitivity reactions that may

increase the risk of SSI. If hair removal is deemed necessary by the surgeon, it should be accomplished with the use of clippers just before the skin incision.

Blood glucose and body temperature are both related to risk of SSI. Perioperative control of blood glucose (< 200mg/dl) has been shown to reduce the risk of SSI in diabetics and non-diabetic cardiothoracic surgery patients. Maintenance of perioperative normothermia has been shown to reduce the risk of SSI following colorectal surgery.

Recommendation 7.1
Healthcare facilities should form a multidisciplinary committee to develop, implement and periodically evaluate compliance with policies and procedures to prevent SSI.

Recommendation 7.2
Healthcare facilities should provide surgical teams with risk stratified infection rates using the CDC definitions of an SSI infection.

Recommendation 7.3
Administer prophylactic antimicrobials to surgical patients according to established national guidelines. Healthcare facilities should adopt measures to ensure that: (1) physicians use the recommended prophylactic antibiotic, (2) that the prophylactic antimicrobial is administered within 1 hour before the incision (except for vancomycin which is administered two hours before the incision), (3) that only one dose of an antimicrobial is given unless the procedure is longer than the half-life of the drug and (4) the prophylactic antimicrobial is discontinued within 24 hours of the surgery (except after cardiac surgery, after which antibiotics may be discontinued within 48 hours).

Recommendation 7.4
Healthcare teams should remove hair when necessary from the surgical site with clippers; razors should not be used.

Recommendation 7.5
Healthcare facilities should select an appropriate preoperative antiseptic skin preparation agent in conformity with the CDC SSI prevention guidelines.

Recommendation 7.6
Healthcare teams should maintain serum glucose lower then 200mg/dl for diabetic and cardiothoracic patients during the perioperative period.

Recommendation 7.7
Healthcare teams should maintain the patient’s body temperature between 36 - 39 degrees centigrade during colorectal surgery procedures.

Recommendation 7.8
Healthcare teams should use aseptic technique to prevent contamination of the open wounds; follow current Association of Operating Room Nurses (AORN) as a standard of care.

Recommendation 7.9
Healthcare facilities should use the CDC *Guideline for Hand Hygiene in Health-care Settings* when developing policies and procedures addressing surgical hand antisepsis.

Recommendation 7.10
Healthcare facilities should ensure healthcare worker compliance with current instrument cleaning, disinfecting and sterilizing procedures. Use Association for the Advancement of Medical Instrumentation standards to development policies, protocols and competencies for instrument decontamination and sterilization.

8. Recommendations for the Prevention of Ventilator-Associated Pneumonia

Ventilator-associated pneumonia (VAP) is the most common HAI in ICU patients and contributes disproportionately to both poor outcomes and the high cost of caring for critically ill patients. As many as 10% to 20% of patients receiving >48 hours of mechanical ventilation develop VAP, with a two-fold increase in mortality (attributable mortalities of 6 - 40%), and an increase in hospital stay of 4 -11 days at a cost of $10,000 - $40,000 per infection.

Recommendation 8.1
Healthcare facilities should form a multidisciplinary committee that includes frontline staff to develop, implement and periodically evaluate compliance with policies and procedures to prevent VAP.

Recommendation 8.2
Healthcare facilities should implement the CDC *Guidelines for the Prevention of Healthcare Associated Pneumonia*, 2003 Category 1A and 1B recommendations related to VAP and incorporate the additional IHI recommendations found at: http://www.ihi.org/ihi including the following process recommendations:

- Elevate the head of the bed of ventilated patients to 30° to 45° (in the absence of medical contraindication) to prevent aspiration.
- Reduce sedation and analgesic administration and assess readiness to extubate the patient on a daily basis.

Recommendation 8.3
Healthcare facilities should educate health-care workers about VAP infection prevention measures.

Recommendation 8.4
Healthcare facilities should develop methods to assess healthcare worker compliance with facility policies and procedures including accountability and incentive structures.

Recommendation 8.5
Healthcare facilities should monitor rates of VAP infection using the CDC surveillance definitions for HAI pneumonia.

Recommendation 8.6
Healthcare facilities should report rates of infection and compliance with process measures internally and use the data to support VAP quality improvement efforts.

Section III. Appendices

Appendix A

Historic Overview of Infection Surveillance and Prevention Programs

Recommendations that specifically address surveillance and prevention of healthcare-associated infections (HAI) have a long history and, in fact, were the precursor to current quality and performance improvement programs. The following is a brief chronological overview:

- 1958 - American Hospital Association (AHA) Advisory Committee on Infections within Hospitals in response to a nation-wide outbreak of *Staphylococcus aureus* infection primarily in newborn infants recommended the implementation of infection surveillance programs.
- 1970 - Centers for Disease Control and Prevention (CDC) recommended that hospitals hire and train nurses and hospital epidemiologists.
- 1976 - Joint Commission on Accreditation of Healthcare Organizations (JCAHO) published the first standards for organization, surveillance. reporting, evaluation, record maintenance, and other infection surveillance and prevention activities as a condition of accreditation.
- 1983 - CDC completed the Study on the Efficacy of Nosocomial Infection Control (SCENIC) project which demonstrated an overall 32% reduction in HAI infections involving 4 major sites (respiratory, surgical wound, urinary and respiratory tract) in hospitals with trained hospital epidemiologists (physicians) and professional nurses who coordinated high-intensity surveillance and prevention programs.
- 1998 - The national benchmark consensus panel report, *Infrastructure, Category Requirements and Essential Infection Control Activities* was published in the Society for Healthcare Epidemiology of America (SHEA) journal (ICHE, Feb.1998). The SHEA consensus panel convened in July 1996 and the report including the recommendations was endorsed by panel members representing JCAHO, AHA, the CDC, the Association for Professionals in Infection Control and Epidemiology (APIC) and other professional organizations.
- 1999 - CDC incorporated the consensus panel recommendations for specific activities/functions that, when fully implemented, assure compliance with and reflect JCAHO requirements. The seven essential functions include:
    1. Managing Critical Data and Information
    2. Setting and Recommending Policies and procedures
    3. Compliance with Regulations, Guidelines and Accreditation Requirements
    4. Intervening Directly to Prevent Transmission of Infectious Diseases
    5. Education and Training of Healthcare Workers
    6. Personnel Support

7. Non-personnel Support

- 2000 - “To Err is Human” was published by the Institute of Medicine, giving rise to a renewed emphasis on patient safety with particular attention to prevention of HAI.
- 2001 - Agency for Healthcare Research and Quality (AHRQ) issued a report entitled Making Health Care Safer: A Critical Analysis of Patient Safety Practices which recommended 79 evidence-based patient-safety practices. Seven of these practices involved infection control or prevention and were judged worthy of widespread implementation based on the strength of the evidence:
    1. Practices to improve hand washing compliance
    2. Barrier precautions
    3. Changes in antibiotic use
    4. Prevention of healthcare associated urinary tract infections
    5. Prevention of intravascular catheter associated Infections
    6. Prevention of ventilator-associated pneumonia
    7. Prevention of Surgical Site Infections
- 2005 - Centers for Medicare and Medicaid Services (CMS) Conditions of Participation and Conditions for Coverage reinforced that health care organizations must meet certain requirements to participate in the Medicare and Medicaid programs. These standards are used to improve quality and protect the health and safety of beneficiaries.
- 2005 - CDC’s Healthcare Infection Control Practices Advisory Committee (CDC’S HICPAC) issued a guidance document to assist policymakers, program planners, consumer advocacy organizations, and others tasked with designing and implementing public reporting systems for HAIs. CDC’S HICPAC recommended that persons who design and implement such systems:
    1. Use established public health surveillance methods when designing and implementing mandatory HAI reporting systems
    2. Create multidisciplinary advisory panels, including persons with expertise in the prevention and control of HAIs, to monitor the planning and oversight of HAI public reporting systems
    3. Choose appropriate process and outcome measures based on facility type and phase in measures to allow time for facilities to adapt and to permit ongoing evaluation of data validity
    4. Provide regular and confidential feedback of performance data to healthcare providers.

  CDC’S HICPAC recommended that states establishing public reporting systems for HAIs select one or more of 5 specific process or outcome measures as appropriate for hospitals or long-term care facilities in their jurisdictions.
- 2005 - JCAHO issued revised standards for hospital infection control programs.
- 2005 - Institute of Healthcare Improvement (IHI) The IHI, a non-profit organization founded in 1991, has been the catalyst for nation wide

changes to improved patient outcomes in the U.S. The goal of IHI is to promote saving a specified number of lives (100,000 between January 2005 and July 2006) through the adoption of evidenced-based practices and procedures that can improve patient outcomes. According to Donald Berwick, MD, President and CEO of IHI, as of September of this year, 2800 hospitals (half of all US acute care hospitals) had joined the campaign. The three infection prevention related bundles recommended by IHI for implementation include:

- Central line associated infections;
- Surgical site infections; and
- Ventilator associated pneumonia.

Appendix B

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Appendix C

Glossary of Abbreviations

ACIP	Advisory Committee for Immunization Practices
AHRQ	Agency for Healthcare Research and Quality
APIC	Association for Professionals in Infection Control and Epidemiology
AWG	Advisory Working Group
BSI	Bloodstream infections
CDC	Centers for Disease Control and Prevention
CVC	Central venous catheters
DHS	California Department of Health Services
HAI	Healthcare Associated Infections
HICPAC	CDC's Hospital Infection Control Practices Advisory Committee
IHI	Institute for Healthcare Improvement
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
LHD	Local Health Departments
MDRO	Multi-drug resistant organisms
MRSA	Methicillin-Resistant Staphylococcus aureus
SHEA	Society for Healthcare Epidemiology of America
SSI	Surgical site infections
VAP	Ventilator-associated pneumonia